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## Dewey's Technological Literacy: Past, Present, and Future

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Technological literacy was defined, though not so named, by John Dewey at the turn of the past century. Dewey described how schooling could lay the groundwork for understanding the practice and implications of producing for society's needs. He talked about the importance of technologically literate individuals and collective knowledge production in the development of thoughtful citizens capable of critical thinking. This was evident in 1915, as Dewey and Dewey noted:

Unless the mass of workers are to be blind cogs and pinions in the apparatus they employ, they must have some understanding of the physical and social facts behind and ahead of the material and appliances with which they are dealing . . . What is wanted is that pupils shall form the habit of connecting the limited information they acquire with the activities of life, and gain ability to connect a limited sphere of human activity with the scientific principles upon which its successful conduct depends. (pp. 246-247)

Implementing this today might mean questioning where the materials come from, examining the lives of the people who produce the materials, investigating the process by which the goods move from their source to the classroom, and determining the resources required to produce that effect. Such pedagogy would encourage independent research on each

of these subjects, together with discussions of moral and ethical elements. Invention and innovation would be piqued as the students are challenged to incorporate social, environmental and economic concerns; problem-solve across disciplines; and perhaps even move projects out into the community at large. Using technological literacy as a means, education could assist in the development of constructive, critical, and creative participants in a democratic society.

Within the current educational practice of isolating disciplines, such broad-spectrum projects have become scarce. As well, the emphasis of education has shifted strongly toward preparing young people for the workforce, to the detriment of their preparation as citizens in a democracy.

## The Past

### *The New Republic Debate*

During the early 1900s, with the development of free public schooling for all children, there was a struggle for the soul, mind, and hands of people. The dichotomy could be framed as those looking for education to develop thinking, capable citizens, and those who were looking toward education to develop cogs for the wheels of industry (Kantor, 1986). Was it to be education through occupations, or education for occupations?

The 1915 debate in the *New Republic* between John Dewey and David Snedden laid out the moral, ethical, and industrial challenges of this discussion, one that continues to resonate among educators today (Hyslop-Margison, 2001). Dewey's commitment to education as a foundational requirement for active participation for all citizens in a democratic society formed the basis for his remarks in the *New Republic* (Dewey, 1915). Snedden seemed to have been driven both by the needs of industry for workers and the potential for vocational education to emerge as its own industry, as a service to industrial development.

Snedden (1915) made clear his orientation in the statement, "Vocational education is, irreducibly and without unnecessary mystification, education for the pursuit of an occupation" (p. 41). Even more telling was Snedden's suggestion that vocational education must result in "a greater productive capacity" (p. 41). Dewey's (1915) response reiterated his position that education's purpose was larger than the "acquisition of specialized skill in the management of machines" and that this definition of vocationalism was "at the expense of industrial intelligence based on science and a knowledge of social problems and conditions" (p. 42). Perhaps it was Dewey's clear expression of what he believed to be the transformational purpose of vocational education that sealed the fate of technical training to the present day.

I object to regarding as vocational education any training which does not have as its supreme regard the development of such intelligent initiative, ingenuity and executive capacity as shall make workers, as far as may be, the masters of their own industrial fate . . . I am utterly opposed to giving the power of social predestination, by means of narrow trade-training, to any group of fallible men no matter how well-intentioned they may be. (p. 42)

Herrick (1996) reiterated the class nature of that argument when he commented on the similarity of this historical debate and the discussion of academic and vocational integration today.

Dewey's arguments for a unitary system, a system that integrates vocational and academic curriculum, are being debated today as they were in the early part of this century . . . Dewey felt that separate vocational and academic programs

further divided the social classes, a proposal he called "undemocratic." Dewey therefore regarded the Smith-Hughes Act, which initiated separate vocational curricula in schools, as symbolizing a conflict between educational and industrial ideals. (p. 17)

Snedden's social efficiency argument, in tandem with his drive for vocational streaming in the schools, promoted both gender and class social engineering, with women's education being refocused from industrial to home economics. With the passing of the Smith-Hughes Act of 1917 and its federal aid for vocational education, the split between vocational education and academic education congealed; and the potential class and gender biases solidified. According to [Rury \(1984\)](#), Snedden was an advocate of sexual differentiation in education and felt that courses for women in high schools should be fitted to their life roles.

[Zuga \(1998\)](#) documented the work of women in establishing early industrial arts professional associations and in developing and implementing curriculum innovations. The notions of these early industrial arts developers foreshadowed today's movement to consider technical skills as life skills.

[Zuga \(1998\)](#) queried "how industrial arts became tied to vocational education for political expediency" and what caused vocational education to split into two camps, with "trade and industry males and . . . home economics females" (p. 29). It is clear that the influence of Snedden during the second decade of the 20th century promoted this division of labor that has influenced technological literacy to the current day.

### **The Past Moves Into the Present**

#### *The Challenges to Dewey's Vision*

At the beginning of the 21st century, technology educators are still challenged by the same dichotomies. The current discourse regarding the purposes of schooling echoes the debates of the past century with disturbing accuracy. While many people today recognize the need to foster critical thinking, imagination, communication skills, initiative, and leadership, the systems that have been created stand rigid in their inability to adapt to educating all people for these essential attributes. As well, the embedded racial and gender bias in past traditions of technological literacy have continued to limit access ([Jackson & Gaskell, 1986](#)). As long as technological literacy is framed as "the new vocationalism" ([Grubb, 1996](#)), it will be deemed appropriate to only a small percentage of the population, thereby sustaining the stranglehold the masculinized vocational training sector has maintained as the gatekeeper of tools and techniques.

Educational systems have moved away from Dewey's philosophy and practice, although many current theorists attribute at least some part of their direction to Dewey's work ([Grubb, 1997](#)). This seems particularly true in technology education, in which the concept of learning through occupations has been markedly misinterpreted. Dewey built his ideas on the concept that in a democracy, everyone is important and responsible to and for what is done in the name of progress. Many in technology education programs focus singularly on defining occupations as vocations related to work, or even industrial progress, rather than those activities in which individuals are engaged to construct their life and their society, which would include work.

#### *The Original Vision*

An examination of Dewey's own words may show how misinterpretation of these ideas during the past 100 years has moved schools away from developing technological literacy for the purpose of having an effective and informed citizenry--a means to an end--toward education of the masses as fodder for wars and industrial exploitation, workers with only the

technical skills to do a particular job--an end in itself.

Dewey (1916) went on to clarify his position by noting that: The lever, the wheel, inclined plane, etc., were among the first great intellectual discoveries of their kind, and they are not the less intellectual because they occurred in the course of seeking for means of accomplishing practical ends. The great advance of electrical science in the last generation was closely associated, as effect and as cause, with the application of electric agencies to means of communication, transportation, lighting of cities and houses, and more economical production of goods. These are social ends, moreover, and if they are too closely associated with notions of private profit, it is not because of anything in them, but because they have been deflected to private uses: a fact which puts upon the school the responsibility of restoring their connection in the mind of the coming generation, with public scientific and social interests. (pp. 208-209)

An education which acknowledges the full intellectual and social meaning of a vocation would include instruction in the historic background of present conditions; training in science to give intelligence and initiative in dealing with materials and agencies of production; and study of economics, civics and politics to bring the future worker into touch with the problems of the day and the various methods proposed for its improvement. Above all, it would give individuals the power of readapting to changing conditions so that future workers would not become blindly subject to a fate imposed upon them. (Dewey, 1916)

The hegemony of Snedden's view has taken North American education away from the egalitarian ideal of contributing members of a democracy toward an even more delineated class structure of "haves" and "have-nots" with little industrial intelligence and a sense of learned helplessness, enhanced and engendered through highly transmissive public industrial education. However, there are also some educators who have consciously or unconsciously gone back to Dewey's (1916) ideas to move into the future with similar intentions, technological literacy as a means to an education suitable to the challenges of our global world. They recognize that democracy and the survival of the earth as it is known is dependent upon the informed participation of its occupants.

### *Constructive Activities as the Center for the Social Life*

The primary thesis inherent in much of Dewey's work is that children, through their play, emulate and experiment with activities in the social milieu, thereby developing practical skills, academic skills, and critical thinking skills which they then continue to apply to the society in which they live and work. Manual training provided the context in which the children of Dewey's era could explore and manifest an understanding of the elements needed and used in their daily life. It was through the desire to engage in and improve upon these constructive activities that children would build their own sense of efficacy and express needs for exploring and incorporating specific academic disciplines for the successful accomplishment of their projects based on occupational tasks.

These occupational tasks were undertaken for their intrinsic and constructive values, as well as for their potential value in socializing young people, that is, preparing them for ongoing cooperative, collaborative social relationships. Children at play are occupied with the serious work of childhood: figuring out the workings of the world around them, posing questions, role playing answers, investigating consequences, and posing new questions.

Constructions, experiments, explorations, and practicing are all occupations of childhood, while vocational training is what would actually prepare them for the world of work. While vocations are an essential component of adult life, children are still in the process of developing the cognitive skills to understand and evaluate the uses to which these vocations

can be put. This language of education through occupations, consciously or unconsciously, has been misinterpreted to refer to educating individuals for actual vocations, careers of work in the adult world

### *What Is the New Vocationalism?*

All of this forms the backdrop to the current discourse on the types of skills and abilities that should result from public education. Funding is limited; social, environmental, and technological change is again in massive flux; and English as a second language is a major issue in the schools. Some politicians and educators look toward industry to dictate the objectives of the educational systems. Again, the needs of industry are being identified as educational priorities, while the ethical and social issues are often neglected. Some sectors of the business community have recognized that the kind of critical thinking advocated by Dewey is an essential component of creative innovation and invention. They insist that these skills are necessary to maintain a competitive position in the international market.

The current discourse is filled with the term "new vocationalism." [Gilberti's \(1990\)](#) analysis of Dewey's "education through occupations" depicts the worker as a more intrinsic and engaged part of the society as a whole. Nevertheless, education for careers is now the watchword of public education.

### *Education for Occupations*

Today, many industrial academics tend to shy away from the concept of intellectual and social understandings, and "use vocational education as an instrument for perpetuating the existing industrial regime instead of operating as a means for its transformation" ([Gregson, 1997](#), p. 127). This is similar to Snedden and Possner at the turn of the past century ([Kantor, 1986](#)).

[Grubb \(1996\)](#) used Dewey to justify his own focus on education for occupations as he outlined the concepts of the new vocationalism. The intention of all strands is to train workers for the industrial or information technology economy by "making the skills required in employment first among the goals of formal schooling, and continue a separation between academic programs and vocational programs" (p. 540). He suggested that cluster schools and career academies represent practices recommended by Dewey. However, when students are required to choose a career path in the 10th grade, this kind of educational tracking does not seem to reflect the democratic and egalitarian principles found in a deeper reading of Dewey.

[Lewis \(1998a\)](#) quoted Dewey when suggesting that the democratic nature of Dewey's argument seems to be getting lost in the new vocationalism. [Dewey \(1916\)](#) noted "the influences which educate some into masters, educate others into slaves" (p. 98). Greater worker involvement in workplace solutions and invention, and the earth's need for an environmentally-educated population, require that the misinterpretations of Dewey's vision be reconsidered, as even industry calls for workers and managers with the capacity to think critically, analyze, evaluate, communicate, work collaboratively with others, problem-solve, and use technology effectively. The influence that Snedden, Possner, and departments of labor have had on technical/vocational education seems regrettable.

### *Education through Occupations*

Dewey's notion of civics, taking part in building participatory communities in schools to learn and practice working with democratic issues, is not often found in the classrooms of North America. With immigrants to Canada and the United States coming from countries unfamiliar with democracy as it is practiced here, and disaffected youth, regardless of their origins, in the same position, it is important to assist young and old alike to hone the essential



ability to discuss and make difficult decisions in a collective manner. All members of society need a critical technological literacy to understand and decide how to respond to the environmental and social crises and challenges facing government, industry, and the public today. The first thing to understand about technology is that people have a role, as citizens in a democracy, in deciding the ways in which technologies will be used in society (Dewey, 1915).

Dewey's description of industrial intelligence (1917) suggested that academic and vocational education should not be separated, and that one learns most effectively through engagement of the hands, mind, and heart together. Whether the new vocationalism really fosters or even creates room for industrial intelligence has not yet been determined. It is certain that industrial intelligence does not leave room for docility and polite recitation or the solving of problems without consideration of the potential social, environmental, and economic impacts, but requires participation and initiative on the part of all workers and citizens. It is unclear whether the autonomy, initiative, critical thinking, and intervention necessary for innovation will be welcomed in all workplaces or educational institutions.

Jane Addams, a social reformer and colleague of Dewey, challenged the techno-rational efficiency of industry's position, noting that she was not willing to agree that industrial education was one area and cultural education of necessity quite another. She indicated that every industry is filled with complicated machinery that offers possibilities of enormous cultural value, if teachers have the ability to bring out its long history, including the human and the mechanical development it represents (National Society for the Promotion of Industrial Education, 1908).

Addams concluded that such an educational system does not provide the children destined for the factory with the knowledge needed to participate in industrial and social life. The educator must, therefore, show the average workers how they fit into a democracy, how to obtain citizenship, and how, as members of society, they can influence the industrial and social settings (Gilberti, 1990)

### *Finding Substance and Sustenance in Integration*

It does appear that both in Canada and in the United States, a new interpretation of what Dewey proposed has been emerging. The Secretary's Commission on Achieving Necessary Skills (SCANS) (1991), after surveying the requirements of current and future jobs, outlined five necessary competencies: the ability to identify and allocate resources, interpersonal skills, capacities related to acquiring and using information, understanding complex systems, and the ability to work with a variety of technologies. Not only are these competencies quite different from those taught in standard academic or vocational courses, but they also require a different approach to teaching, and therefore to teacher education.

Broad skills are being suggested; but ideas are still coming from those who see school as a place for vocational development, and the potential for redirection is great. Grubb (1995) stated that "The SCANS Commission also argued that all students should learn the SCANS competencies, not just those students in special tracks labelled general or career or vocational education" (p. 18).

### *Unitary Curriculum: Both Intrinsic and Instrumental*

More in keeping with Dewey's notion of educating for adequate preparation to participate in society, Lewis (1998a) examined the potential for "a unitary curriculum, devoid of track", elsewhere referred to as "integrated" (p. 291). He explored these arguments in several European countries and Australia, and found similar issues being addressed. According to Lewis, vocational education does need to be informed by an "elegant epistemology that took human experience as its inspiration" (p. 291).

There are other American adherents to Dewey who reject curricular tracking and advocate an integrated curriculum. **Silberman (1982)** noted that vocational education is comprised of both intrinsic and instrumental aspects. Hands-on skill development leads to a sense of personal efficacy, to which he refers as "practical-knowledge-as-knowledge."

Silberman then set forth five dimensions of human development that could be augmented by emphasizing intrinsic qualities of the vocational subject: acquiring a sense of personal competence, enjoying the opportunity for aesthetic expression, acquiring a sense of integrity, learning interpersonal skills and the value of cooperativeness (through teamwork and the development of interpersonal skills), and developing a sense of altruism (through completing vocational projects that provide community service or help to improve community life). (**Lewis, 1998**, p. 289)

The need to interrogate the work that is done today is an essential component of technological literacy, and therefore must be an integral part of any common curriculum. Job satisfaction, work values, work commitment, and ultimately, an individual's sense of worth are issues that go beyond the practicalities of getting the job done, and foster dialogue about how a democratic society should operate (**Lewis, 1998b**).

### *Class and Gender Matters*

In responding to Lewis, the context into which **Apple (1998)** framed the discussion of the integration of academic and vocational education provided warning that the battle for technological literacy and industrial intelligence could easily be lost in class and turf wars for subject matter privilege. He warned that the possible "latent effects of making vocational education of more equal status" be considered (p. 322). The academization of vocational epistemology "could actually lose its existing possibilities for social criticism and for integrating head, hand, and heart together" (p. 322). He urged society to take into consideration the historical effects of existing power relations whose knowledge is privileged in the schools. Noting the gendered divisions of labor and the valuing of paid work beyond that done both inside the home and inside the community which does not receive financial remuneration, he calls into question "the very constitution of what actually gets counted as work" (p. 324).

**Apple (1998)** noted that a common core of subject matter is problematic, not only in who decides what that is, but also because it has a very transmissive ring to it. What is needed now is teaching students how to ask informed questions, how to develop the background knowledge to pose those questions, and how to evaluate the potential answers, not simply providing the inculcation of yet another set of subject matter. Apple's insight into the use of programs developed as a potential "counter hegemonic action and for the possibility of interrupting relations of dominance and subordination" grounds the rhetoric into useful program intervention to "deacademiciz[e] academic knowledge" (p. 328) and uses it to reexamine technocratic solutions. That he highlights only traditional labor-based examples, rather than many of the community-based training initiatives which have emerged in the past 15 to 20 years, speaks to the walls that academia has continued to build around itself (**Braundy, 1998**).

## **The Potential Future**

### *Technological Literacy for Citizenship*

While Dewey might have left it to practice and reflection to develop an understanding of the place of technological literacy, leading to the need for learning numeracy, reading, and writing, the context of citizenship that accompanies the following rationale could well have come straight from the educational philosopher's mouth. The philosophical base of the

technology education programs suggested that "students need to understand how humans shape technology and the impact that current and future technologies will [can] have on our society, culture, and environment" (British Columbia. Ministry of Education, 1995, p. 8).

The International Technology Education Association (ITEA) (2000) has also developed standards for technological literacy. These standards specify what a student should know and should be able to do, and at what grade level, in order to be considered technologically literate. The concepts and topics are well thought out and cover a great deal of subject matter. There is, however, a lack of affective domain language in the standards. Additionally, there is a quality of mystification in the discourse, a suggestion that there is some already-identified knowledge with which each student must come away, able to perform to a specified standard of reproduction. "Students will develop . . . an understanding . . . and abilities . . . [and will] know about technologies" (ITEA, 2000, p. 10). Rather than Dewey's notion of child-centered, the framing of the material seems to be teacher-centered; and one must wonder, along with the National Academy of Engineering, who worked as advisors to the project and whose goals were served.

Ultimately, these are not objective issues; and those drawn to technical studies will be making essential decisions with an impact on the future of our society. Dewey would not suggest that certain subject matter should be absorbed by all students at a specified time in their life, nor that they should each be assessed for how well they have absorbed what it is that others agree they should know, nor, finally, that this assessment would influence where and how they engage with the work and life of society.

Mosher (1995) noted that:

Dewey argued for a community of learners where the teacher was the most mature member and the one charged to guide the children's learning by arranging a depth of quality and constructiveness of experience. Learning is to be shared cooperatively by students and the teacher, a process which requires more subtle guidance and control than the overt authority of the traditionalist. Further, learning must be an active involvement of the cognitive, social, and moral competencies of children challenged by problems just out of reach of their immediate comprehension. It is learning with both feet planted firmly on the ground and sleeves rolled up to admit hands-on experience and learning by doing." (p. 13)

#### *How Else Might the Past Speak To and For the Future?*

Technology and vocational educators cannot alone right societal ills such as the underrepresentation of women and visible minorities in technical occupations. Lewis (1998b) indicated that educators "can teach both their male and female students that work should be attended by a certain morality. They can do so by organizing them to work cooperatively, by apportioning learning opportunities in a gender-inclusive way" (p. 337), and by representing diverse populations at work in a wide variety of careers.

Additionally, Lewis (1998b) noted that "How to balance work, family, and community aspects of one's life is probably the single greatest goal to which vocationalism as an idea should aspire" (p. 337). This would be in tune with Dewey's (1916) concept of the role of vocational education. What if the number of occupations runs out and a society where the people's needs are cared for in an egalitarian way still has not been created? Who lives? Who dies? What "skills" will be needed? If education for occupations, jobs, and the work to be done is continued, how long in this age of technological change will that education be valid and useful? It is only by building on Dewey's notions of education through occupations that a more responsible route into the global society of the 21st century can be found.



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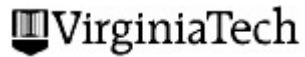
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